Twelve occurrences of *Astragalus tener* var. *tener* occur on sites protected by conservation organizations or on public land. Three are within the Jepson Prairie Preserve in Solano County (C. Witham *in litt.* 1990, California Natural Diversity Data Base 2001). Two occurrences are on the Wilcox Ranch in Solano County, part of which is owned and managed by The Nature Conservancy and the other part of which is owned and managed by Solano County (J. Marty, pers. comm. 2004). Four occurrences are on Federal or State wildlife areas in Merced County: the Arena Plains Unit of the Merced National Wildlife Refuge, Kesterson National Wildlife Refuge, the Los Banos Wildlife Management Area, and the North Grasslands Wildlife Management Area (Silveira 1996, California Natural Diversity Data Base 2001). *Astragalus tener* var. *tener* grows on land administered by the U.S. Department of Defense at Travis Air Force Base in Solano County and the U.S. Air Force Communications Facility in Yolo County (California Natural Diversity Data Base 2001). Also, one Yolo County occurrence is on property protected by a conservation easement with the City of Woodland (C. Witham *in litt.* 1990, California Natural Diversity Data Base 2001). However, this taxon is not necessarily protected simply by virtue of existing on public lands. No particular management activities have been undertaken for *A. tener* var. *tener*, and monitoring is sporadic.

3. *ATRIPLEX PERSISTENS* (VERNAL POOL SMALLSCALE)

a. Description and Taxonomy

Taxonomy.—This species is in the goosefoot family (Chenopodiaceae). Vernal pool smallscale was recognized as a unique species only recently. Stutz and Chu (1993) gave it the scientific name *Atriplex persistens*. Specimens of vernal pool smallscale collected prior to publication of the name had been incorrectly assigned to Parish's brittlescale (*Atriplex parishii*), a southern California species. The type locality of vernal pool smallscale is "Glenn Co., 5 miles S of Willows, 1/4 mi SW of Sacramento Wildlife Refuge Headquarters" (Stutz and Chu 1993:211). Other common names by which it is known are vernal pool saltbush (Silveira 1996, Keeler-Wolf *et al.* 1998) and persistent-fruited saltscale (California Department of Fish and Game 1999, California Natural Diversity Data Base 2001).

Description and Identification.—*Atriplex persistens* (**Figure II-24**) is an annual. The plants appear silvery-green (Silveira 1996) because the leaves and branches are covered with whitish, mealy scales. The 10- to 20-centimeter (4- to 8-inch) long stems may be upright or curved outward, and the branches originate from the base. *Atriplex persistens* has alternate, stalkless leaves 2 to 4 millimeters (0.08 to 0.16 inch) long. The leaves are basically egg-shaped with smooth margins, although their bases range from heart-shaped to triangular. Male and

female reproductive parts are borne in separate, inconspicuous flowers. The male flowers occur in clusters in the upper leaf axils or at the branch tips, whereas the female flowers occur singly in the lower leaf axils. Each fruit consists of a single, reddish-brown seed enclosed by two bracts. The bracts are 3 to 4 millimeters (0.12 to 0.16 inch) long, wider at the tip than at the base, coarsely toothed on the upper margins, and have a few tubercles on their surfaces. At maturity, the center and base of each bract become hardened. The fruits remain on the branches even after the plants have died, a characteristic reflected in the scientific name of the species. The diploid chromosome number of *A. persistens* is 18 (Stutz and Chu 1993).

The annual species most easily confused with *Atriplex persistens* is *A. parishii*. However, *A. parishii* is restricted to southern California; male and female flowers occur together in axillary clusters; the fruiting scales remain soft, are not toothed, and are widest below the middle; and the fruits detach easily from the stem. *Atriplex fruticulosa* (ball saltbush) has hardened fruiting bracts, but they are widest at the middle, the fruits are not persistent, the leaves are longer than in *A. persistens*, and the plants are perennial (Stutz and Chu 1993, Taylor and Wilken 1993).

b. Historical and Current Distribution

Historical Distribution.—*Atriplex persistens* was collected from only five localities prior to 1990, all in the San Joaquin Valley Vernal Pool Region (Keeler-Wolf *et al.* 1998) (**Figure II-25**). The earliest record is from 1926, when Howell collected the species southwest of Merced, Merced County. Another site was discovered southwest of Merced during the late 1980s (Stone *et al.* 1988, California Natural Diversity Data Base 2001). In the 1960s, *A. persistens* was collected south of Modesto in Stanislaus County and west of Pixley in Tulare County (Stutz and Chu 1993, California Natural Diversity Data Base 2001). Another occurrence was discovered near Pixley in 1985 (California Natural Diversity Data Base 2001).

Current Distribution.—Since 1990, 27 additional populations of *Atriplex persistens* have been found in Glenn, Madera, Merced, and Solano Counties. However, three occurrences apparently have been extirpated, one each in Merced, Stanislaus, and Tulare Counties. Thus, of 32 known occurrences, 29 are believed to remain extant (California Natural Diversity Data Base 2005). Eleven of these are in the Solano-Colusa Vernal Pool Region, and the other 18 are in the San Joaquin Valley Vernal Pool Region (Keeler-Wolf *et al.* 1998). The largest concentration, comprising 11 occurrences, is on the Sacramento National Wildlife Refuge in Glenn County. The second-largest concentration is in central Merced

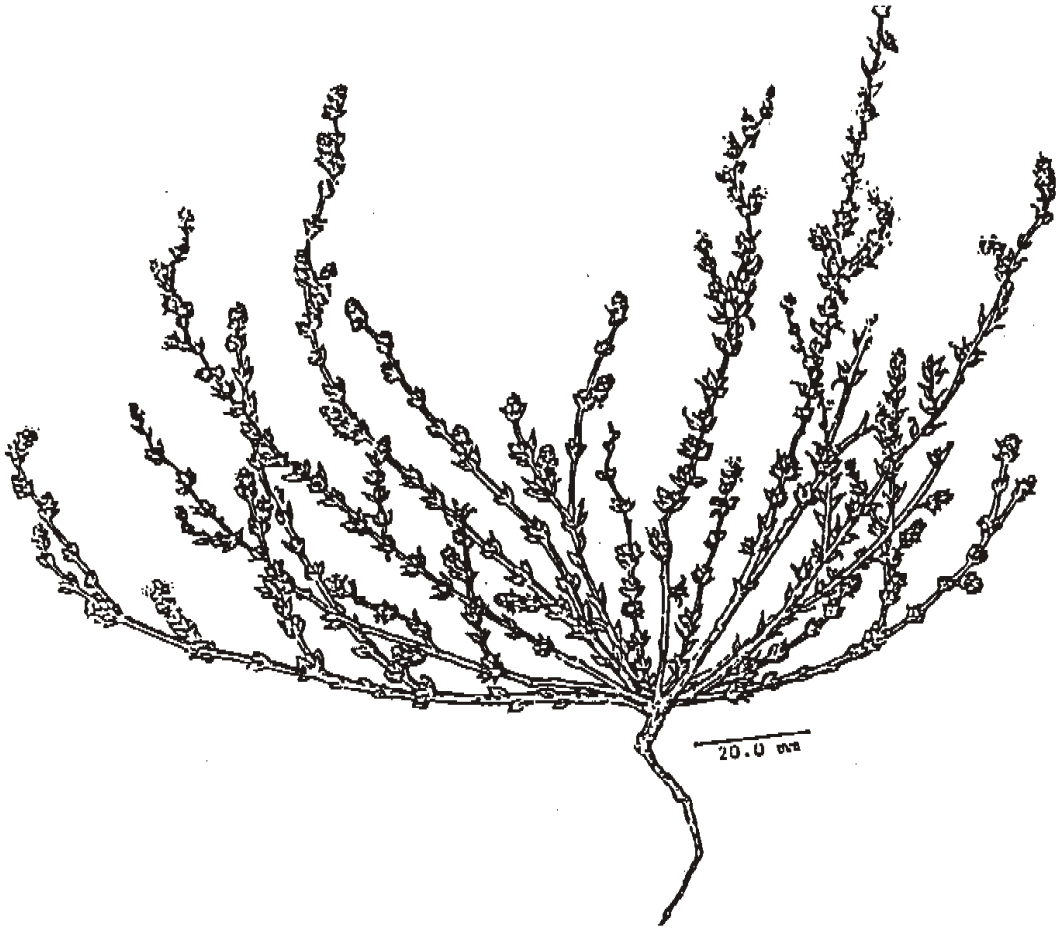

Figure II-24. Illustration of *Atriplex persistens* (vernal pool smallscale). (Reprinted with permission from the California Botanical Society)

Figure II-25. Distribution of *Atriplex persistens* (vernal pool smallscale).

County between Los Banos and Merced, where 11 occurrences remain extant. The other seven extant occurrences are in Solano, Madera, and Tulare Counties (California Natural Diversity Data Base 2005).

c. Life History and Habitat

Reproduction and Demography.—*Atriplex persistens* was described so recently that little information has been collected on its life history. However, it is a summer annual that flowers from July through September (Stutz and Chu 1993). Germination dates and conditions have not been reported, nor have demographic parameters or pollination agents. Population size has been reported only for the Arena Plains Unit of the Merced National Wildlife Refuge, where about 10,000 plants were observed in 1995 (California Natural Diversity Data Base unprocessed data).

Habitat and Community Associations.—*Atriplex persistens* has been observed only in large, alkaline vernal pools, where it occurs in the bottoms of the basins as opposed to the edges (D. Taylor pers. comm. 1997). These pools are considered the Northern Claypan type (Keeler-Wolf *et al.* 1998). The Glenn County pools contained water about 15 to 30 centimeters (6 to 12 inches) deep in the spring seasons of 1991 and 1993 (Stutz and Chu 1993). In Merced County, this species occurs on sandy, silty clay soils (California Natural Diversity Data Base 2001); soil types have not been noted elsewhere. Reported populations were at elevations ranging from 8 to 105 meters (25 to 345 feet) (California Natural Diversity Data Base 2001).

Atriplex persistens co-occurs with many of the other plant species featured in this recovery plan, including *Chamaesyce hooveri*; *Orcuttia pilosa*, *Neostapfia colusana*, *Astragalus tener* var. *ferrisiae*, *Astragalus tener* var. *tener*; *Tuctoria greenei*, and *Legenere limosa* (Stone *et al.* 1988, Oswald and Silveira 1995, Silveira 1996, J. Silveira *in litt.* 2000, California Natural Diversity Data Base 2001). Other plants with which it is commonly associated are *Cressa truxillensis*, *Bassia hyssopifolia* (hyssop-leaved bassia), *Frankenia salina*, *Grindelia camporum* , *Hemizonia pungens* (common spikeweed), and *Distichlis spicata* (J. Silveira *in litt.* 2000).

d. Reasons for Decline and Threats to Survival

Most species addressed in this recovery plan are threatened by similar factors because they occupy the same vernal pool ecosystems. These general threats, faced by all the covered species, are discussed in greater detail in the Introduction section of this recovery plan. Additional, specific threats to *Atriplex persistens* are described below.

The comparison of recent versus historical accounts of this species fails to document a decline. Although Stutz and Chu (1993) indicated that they could not find the species at any of the historical sites, it has since been rediscovered in Merced and Tulare Counties. Nevertheless, much suitable habitat of this species throughout the Central Valley has no doubt been lost or degraded, due to the same primary factors that have reduced populations of various other vernal pool-related species addressed earlier in this document.

One specific continuing threat is altered hydrology, which threatens the survival of *Atriplex persistens* in the East Grasslands of Merced County, where vernal pools have been flooded illegally for use as duck ponds (J. Silveira *in litt.* 2000).

e. Conservation Efforts

Atriplex persistens has no official Federal or State status. However, the California Native Plant Society has added it to List 1B of the sixth edition of their *Inventory of Rare and Endangered Vascular Plants of California* (California Native Plant Society 2001), indicating that they view the species as endangered throughout its range.

Although *Atriplex persistens* has not been the subject of focused survey efforts, it has been discovered during general surveys for vernal pool plants (Stutz and Chu 1993, Silveira 1996, D. Taylor *in litt.* 1997). Of the 29 *A. persistens* populations currently known to be extant, 19 (66 percent) are on public land or in nature preserves. However, no specific measures have been undertaken to conserve or manage for this species on these or other sites. The occurrences in public ownership include 11 on the Sacramento National Wildlife Refuge and 4 in Merced County: 2 in San Joaquin Grasslands State Park, and 1 each on the Arena Plains Unit of the Merced National Wildlife Refuge and the North Grasslands Wildlife Management Area. The two nature preserves where *A. persistens* occurs are the Jepson Prairie in Solano County and the Pixley Vernal Pool Preserve in Tulare County (Stutz and Chu 1993, D. Taylor *in litt.* 1997, California Natural Diversity Data Base 2001).

4. *ERYNGIUM SPINOSEPALUM* (SPINY-SEPALED BUTTON-CELERY)

a. Description and Taxonomy

Taxonomy.—Spiny-sepaled button-celery is a member of the carrot family Apiaceae. The scientific name first used for spiny-sepaled button-celery was *Eryngium globosum* (Jepson 1922). However, the name *Eryngium globosum* had already been used to represent an entirely different species, so Mathias (1936) changed the name of spiny-sepaled button-celery to *Eryngium spinosepalum*.